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## INTERNATIONAL APPLICATION PUBLISHED UNDER THE PATENT COOPERATION TREATY (PCT)

<b>(51) International Patent Classification <sup>6</sup> :</b> <b>A23C 9/152, 9/154, C12G 3/04</b>	<b>A1</b>	<b>(11) International Publication Number:</b> <b>WO 96/33618</b> <b>(43) International Publication Date:</b> 31 October 1996 (31.10.96)
<b>(21) International Application Number:</b> PCT/GB96/00898 <b>(22) International Filing Date:</b> 15 April 1996 (15.04.96) <b>(30) Priority Data:</b> 9508221.0 22 April 1995 (22.04.95) GB <b>(71) Applicant (for all designated States except US):</b> SCOTTISH & NEWCASTLE PLC [GB/GB]; Abbey Brewery, Holyrood Road, Edinburgh EH8 8YS (GB). <b>(72) Inventors; and</b> <b>(75) Inventors/Applicants (for US only):</b> DUNN, Alexander, Richard [GB/GB]; 38 Barton Park Gardens, Edinburgh EH4 6HN (GB). BOLT, Peter, Stephen [GB/GB]; Bonnygate, Netherlaw, North Berwick EH39 4RF (GB). NAYLOR, Richard, John [GB/GB]; 29 Rossie Place, Edinburgh EH7 SSD (GB). BAXTER, Andrew [GB/GB]; 369 Leith Walk, Edinburgh EH8 6SE (GB). <b>(74) Agent:</b> MURGITROYD & COMPANY; 373 Scotland Street, Glasgow G5 8QA (GB).		<b>(81) Designated States:</b> AL, AM, AT, AU, AZ, BB, BG, BR, BY, CA, CH, CN, CZ, DE, DK, EE, ES, FI, GB, GE, HU, IS, JP, KE, KG, KP, KR, KZ, LK, LR, LS, LT, LU, LV, MD, MG, MK, MN, MW, MX, NO, NZ, PL, PT, RO, RU, SD, SE, SG, SI, SK, TJ, TM, TR, TT, UA, UG, US, UZ, VN, ARIPO patent (KE, LS, MW, SD, SZ, UG), Eurasian patent (AM, AZ, BY, KG, KZ, MD, RU, TJ, TM), European patent (AT, BE, CH, DE, DK, ES, FI, FR, GB, GR, IE, IT, LU, MC, NL, PT, SE), OAPI patent (BF, BJ, CF, CG, CI, CM, GA, GN, ML, MR, NE, SN, TD, TG).  <b>Published</b> <i>With international search report.</i>
<b>(54) Title:</b> BEVERAGE, METHOD OF PRODUCING A BEVERAGE, AND A PRODUCT CONTAINING A BEVERAGE		
<b>(57) Abstract</b>  A milk containing beverage containing a dissolved gas is arranged in a pressurised beverage container. When the container is broached and the beverage poured out dissolved gas comes out of solution to form a dispersion of bubbles in the beverage. This may produce a milk-shake like effect. The gas may be nitrous oxide; the beverage may be flavoured and/or contain alcohol and may have a fat content of 7 %-12 %.		

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1     "Beverage, Method of producing a beverage, and a  
2     product containing a beverage"  
3

4     This invention relates to a beverage, a method of  
5     producing a beverage and a product containing a  
6     beverage, all related particularly, but not  
7     exclusively, to a dispersion of bubbles caused by a  
8     dissolved gas coming out of solution in the beverage.  
9

10    The production of a dispersion of bubbles in a beverage  
11    so as to confer a foamy or frothy texture is  
12    advantageous in some beverages, for example milk  
13    shakes, which are more appealing to the consumer in a  
14    frothy state. Other advantages may also be gained, for  
15    example a reduced volume of liquid may produce a given  
16    volume of frothy beverage.  
17

18    US Patent No 3,615,718 discloses a method for the  
19    production of solid ice cream and ice milk by expelling  
20    an aqueous composition of water and milk proteins from  
21    an aerosol container pressurized with a propellant gas.  
22    The composition is passed through a restricted orifice  
23    in the nozzle of the container, and the resultant  
24    agitation produces a dispersion of bubbles in the  
25    composition resulting in a whipped up solid. A valve  
26    is required at the restricted orifice and is operable  
27    to allow some of the composition to be expelled from  
28    the container, whilst maintaining a pressurised  
29    condition within the container.

1 According to a first aspect of the present invention  
2 there is provided a method of producing a dispersion of  
3 bubbles in a milk-containing beverage, the method  
4 comprising dissolving a gas in the beverage, sealing  
5 the beverage and dissolved gas in a broachable  
6 container, allowing pressure to be induced within the  
7 container and broaching the container to release the  
8 pressure therein, such that upon dispensing the  
9 beverage, at least some of the dissolved gas comes out  
10 of solution to form the dispersion of bubbles in the  
11 beverage.

12

13 Preferably the gas is dissolved in the beverage under  
14 pressure.

15

16 An advantage gained by the present invention is that  
17 the beverage does not need to be expelled at high speed  
18 through an orifice in order to generate the dispersion  
19 of bubbles.

20

21 The dispersion of bubbles may produce a frothy, milk-  
22 shake like effect.

23

24 According to a second aspect of the present invention  
25 there is provided a product comprising a pressurised  
26 beverage container containing a pressurised milk  
27 containing beverage in which the beverage has a gas  
28 dissolved therein and in which at least a portion of  
29 the dissolved gas is arranged to come out of solution  
30 to form a dispersion of bubbles in the beverage when  
31 the beverage is dispensed.

32

33 A portion of the dissolved gas may be arranged to come  
34 out of solution when the container is opened or  
35 broached.

36

1 Preferably, the beverage is of low-medium viscosity.  
2 The beverage may contain at least 85% milk, preferably  
3 at low-medium viscosity.  
4

5 The gas may be, for example, N<sub>2</sub>O, HFC or HCFC.

6 The gas may comprise or include carbon dioxide.

7 However, the properties of carbon dioxide may make it  
8 less desirable than the aforementioned gases. Carbon  
9 dioxide imparts a sharpness of flavour to milk which is  
10 not usually desirable in products of this type. In  
11 addition its slight acidity can alter the properties of  
12 the milk proteins and cause coagulation and separation  
13 of the solids. This latter aspect can be rectified by  
14 the addition of buffering agents and stabilizers but  
15 the overall effect does not enhance the product.  
16

17 A mixture of gasses or a mixture of any of the  
18 aforementioned gasses may be used. The beverage may be  
19 saturated or supersaturated with the gas or gasses.  
20 Bubbles of gas may be suspended in the beverage before  
21 and/or after broaching of the container.  
22

23 One or more flavourings may be added to or included in  
24 the beverage, for example, chocolate, fruit flavours,  
25 malt, coconut, vanilla, coffee, orange, banana.  
26

27 The container is optimally broached at a temperature of  
28 between 2°C and 10°C. The container may be in the form  
29 of a can, bottle, carton or other openable package  
30 capable of withstanding pressure. The container may be  
31 non-reusable. Broaching the container may expose its  
32 entire contents to atmospheric pressure. Alternatively,  
33 the container may be a barrel; it may have an external  
34 pressure source. It may be arranged to allow  
35 withdrawal or dispensing of a portion of its contents  
36 whilst maintaining pressure on the beverage retained in

1 the container.

2

3 The beverage may optionally contain alcohol or an  
4 alcoholic beverage, preferably a spirit, for example,  
5 vodka, gin, or whisky or a liqueur; it may have  
6 additional flavourings which may advantageously be  
7 incorporated into the alcoholic beverage, for example,  
8 a fruit or mint liqueur. Where the beverage contains  
9 alcohol, or an alcoholic beverage, the alcohol is  
10 preferably present in a quantity of at least 1% by  
11 volume of the beverage. The beverage may contain up to  
12 20% alcohol by volume. A greater proportion of alcohol  
13 may be used if desired.

14

15 An important optional feature of the invention is that  
16 the dispersion of bubble in the beverage may be  
17 enhanced when the beverage is dispensed from the  
18 container. Preferably, the beverage does not increase  
19 substantially in volume whilst in the container, and is  
20 not therefore inclined to overflow from the container.

21

22 According to a third aspect of the present invention  
23 there is provided a beverage comprising a milk base  
24 containing nitrous oxide gas dissolved in the milk base  
25 and also comprising alcohol.

26

27 Alcohol may be contained in the beverage, preferably  
28 above 1% by volume and preferably up to 20% by volume.

29

30 The beverage may be contained in a pressurised  
31 container wherein the nitrous oxide causes dispersion  
32 of bubbles within the beverage on being poured from the  
33 container.

34

35 Alternatively, the beverage may be dispensed from a  
36 tap, wherein the nitrous oxide causes dispersion of

1 bubbles within the beverage on being poured from the  
2 tap.

3

4 According to a fourth aspect of the present invention  
5 there is provided a beverage comprising a milk base and  
6 having nitrous oxide gas dissolved in the milk base,  
7 wherein the beverage is maintained under pressure until  
8 ready for consumption.

9

10 The beverage may be maintained under pressure in a  
11 broachable beverage can. Alternatively, the beverage  
12 may be maintained under pressure in a storing means for  
13 dispersing from a tap.

14

15 Ingredients in the beverage may include, for example,  
16 any one or any combination of the following:

17

- 18 i) Any substance suitable for use as a food or  
19 commonly used as a food
- 20 ii) Flavouring
- 21 iii) Colouring, emulsifier, stabiliser, sweetener or  
22 miscellaneous additive
- 23 iv) Starch (modified or not)
- 24 v) Salt
- 25 vi) Vitamin or mineral preparation, for example,  
26 Vitamin D
- 27 vii) Water
- 28 viii) Chocolate
- 29 ix) Fruit
- 30 x) Vegetable fat
- 31 xi) Milk Solids not fat (MSNF)
- 32 xii) Cream
- 33 xiii) Stabiliser
- 34 xiv) Milk powder
- 35 xv) Milk
- 36 xvi) alcohol

1 Th fat content of the beverage may be important in  
2 producing the desired effect. Preferably, the beverage  
3 contains substantially between 7% and 12% fat. Where a  
4 milk base is used, the milk base may contain  
5 substantially between 0%-4% fat; the fat content of  
6 chocolate used may vary between about 25% to 35%.

7

8 Embodiments of the present invention will now be  
9 described, by way of example only.

10

11 The following are a number of alternative basic recipes  
12 for a base mixture of a milk containing beverage.

13

14 1 Full fat milk 86.9%; dairy milk chocolate 8.5%;  
15 plain chocolate 4.5%; stabiliser 0.05% to 0.2%,  
16 for example, Alginates, Xanthans, Carrageenin or  
17 mixtures thereof).

18

19 2 For thin liquid mixture: 92% skimmed milk; 7.9%  
20 milk chocolate; 0.1% stabiliser or alternatively,  
21 90% full fat milk; 2% plain chocolate; 7.9% milk  
22 chocolate; 0.1% stabiliser.

23

24 3 For a mixture of average thickness: 87% full fat  
25 milk; 4.9% plain chocolate; 8% milk chocolate;  
26 0.1% stabiliser or alternatively, 87% full fat  
27 milk; 12.9% white chocolate; 0.1% stabiliser.

28

29 4 For a thick consistency of mixture: 85% whole  
30 milk; 4.9% white chocolate; 8% milk chocolate; 2%  
31 cornflour; 0.1% stabiliser or alternatively, 85%  
32 whole milk; 4.9% plain chocolate; 8% milk  
33 chocolate; 2% coffee creamer; 0.1% stabiliser.

34

35 Typically, stabiliser or stabilisers may be included in  
36 a quantity of 0.05% to 0.2%.



1 All the measurements given in these ingredients are  
2 percentag by weight. The b verag s are in liquid form  
3 with a viscosity similar to single cream unlike known  
4 compositions containing Nitrous Oxide which are frozen  
5 or solid products. The viscosity of the beverage of  
6 the invention varies with temperature but is generally  
7 a medium viscosity liquid.

8  
9 The following method is used to form the mixture. The  
10 chocolate solid is supplied or broken down into  
11 granular form and mixed with half of the milk used in  
12 the recipe in a mixing tank. The term milk is used to  
13 encompass all types of milk and milk like products and,  
14 in particular, full fat, whole, skimmed and UHT milk.  
15 The temperature is raised whilst stirring to at least  
16 50°C until all the chocolate is melted and dispersed.  
17 This takes several minutes. The second half of the  
18 milk is mixed cold with the stabiliser and stirred  
19 until the stabiliser is fully dissolved. The two milk  
20 portions are then combined and cooled to a temperature  
21 of between 0 and 3°C.

22  
23 The cooled milk is supersaturated with gas by injecting  
24 and metering gas under pressure of around 80psi. This  
25 can be done in a variety of ways which are well  
26 established in the beverage industries. For example,  
27 when transferring the product from the mixing tank to  
28 a storage tank, gas can be injected into the transfer  
29 pipe and a suitable back pressure kept on the receiving  
30 tank. Dispersion of the gas is enhanced by pumping the  
31 gas/liquid mixture through a plate heat exchanger to  
32 increase the contact area and time. Alternatively, gas  
33 can be injected at the base of an agitated tank which  
34 is held under a predetermined back pressure. A further  
35 m thod is to recirculate th product from a tank  
36 through a gas injection system and then return it under

1 pressure to the same tank.

2

3 The gassed beverage is then packaged and quickly sealed  
4 by sealing a lid onto the container to avoid loss of  
5 the nitrous oxide, or other gas used, from the mixture.

6

7 Pasteurisation is achieved by conventional means, for  
8 example, by spraying the containers with hot water.  
9 Pasteurisation can be achieved at varying temperatures  
10 depending on the length of time the containers are  
11 exposed at the given temperature. For example, a  
12 container in the form of a can may be raised to a  
13 temperature of 70°C for one hour; preferably, less  
14 rigorous regimes are employed. The beverage may be  
15 flash pasteurised and the containers filled under  
16 aseptic conditions. The beverage may be pasteurised in  
17 accordance with The Milk Based Drinks (Hygiene and Heat  
18 Treatment) (Amendment) Regulations 1986 (1986/720).  
19 For example, in-package pasteurisation may be achieved  
20 by holding the beverage at a temperature of at least  
21 63°C for a minimum of 30 minutes. Alternatively, for  
22 aseptic filling the flash pasteurisation conditions may  
23 require a holding time of at least 15 seconds at a  
24 minimum temperature of 72°C. The product should then  
25 be cooled as soon as practicable and retained at a  
26 temperature below 10°C.

27

28 The mixture is gassed up with nitrous oxide to a level  
29 of between one and four volumes. Gases other than  
30 nitrous oxide could be used, for example, HFCs or  
31 HCFCs. The addition of nitrous oxide is preferred as  
32 it has suitable solubility properties. It is inert and  
33 neutral and only imparts of very slight sweetness to  
34 the product. The solubility of nitrous oxide in water  
35 or milk is enough to produce a good foaming effect  
36 under the required temperature and pressure conditions.

1 Typically, two volumes of gas are dissolved in the milk  
2 product.

3  
4 When the container is broached by opening a closure of  
5 the container, for example, a ring pull on a can, the  
6 product does not immediately expand such that the  
7 container overflows. However, the effect when pouring  
8 out the product from the container is dramatic due, it  
9 is believed, to agitation and seeding of the bubbles  
10 caused by natural, non-forced nucleation of the gas  
11 dissolved in the beverage. The product can expand to  
12 over double its volume and produce a finely dispersed  
13 foam. The foam gradually collapses over a period of  
14 time. If the product is left in the container it will  
15 tend to expand and creep up slowly as the dissolved gas  
16 comes out of solution due to the reduction in pressure.

17  
18 The beverage can also be contained in a storage  
19 container under pressure and dispensed from a tap, for  
20 example at a bar. Preferably, dispersion of the gas  
21 only occurs on the pouring of the beverage when the  
22 Nitrous Oxide or other gas nucleates.

23  
24 In addition, as an optional addition to the  
25 ingredients, alcohol can be added to the mixture, for  
26 example in the form of vodka. The alcohol may be added  
27 to the milk before gassing the milk with nitrous oxide  
28 and packaging. Ideally, 5-10% alcohol would be added  
29 or up to a maximum of 20%.

30  
31 The product may contain preservatives and/or  
32 stabilisers to ensure that it remains fresh and/or  
33 homogeneous for a desired period of time.

34  
35 The product should be dispensed at a temperature above  
36 freezing, preferably at a temperature of between 2°C

1      and 10°C.

2

3      Modifications and improvements may be made to the above  
4      without departing from the scope of the present  
5      invention.

6

1     Claims

2

3     1     A pressurised beverage container containing a  
4            pressurised milk containing beverage in which the  
5            beverage has a gas dissolved therein and in which  
6            at least a portion of the dissolved gas is  
7            arranged to come out of solution to form a  
8            dispersion of bubbles in the beverage when the  
9            beverage is dispensed.

10

11     2     A container in accordance with Claim 1 in which  
12            the beverage contains at least 85% milk.

13

14     3     A container in accordance with Claim 1 or Claim 2  
15            in which the dissolved gas comprises nitrous  
16            oxide.

17

18     4     A container in accordance with any preceding claim  
19            in which the dissolved gas comprises a mixture of  
20            gasses.

21

22     5     A container in accordance with any preceding Claim  
23            in which the beverage is saturated or super-  
24            saturated with the dissolved gas.

25

26     6     A container in accordance with any preceding claim  
27            in which the container is broachable and in which  
28            bubbles of gas are suspended in the beverage  
29            before and/or after broaching of the container.

30

31     7     A container in accordance with any preceding claim  
32            in which the container is in the form of a can,  
33            bottle or carton.

34

35     8     A container in accordance with any preceding claim  
36            in which the beverage contains between 1% and 20%

- 1 alcohol by volume.  
2
- 3 9 A container in accordance with any preceding claim  
4 in which dispersion of bubbles in the beverage is  
5 enhanced when the beverage is dispensed from the  
6 container.  
7
- 8 10 A container in accordance with any preceding claim  
9 in which the beverage does not increase  
10 substantially in volume whilst in the container  
11 when the container is broached.  
12
- 13 11 A container in accordance with any preceding Claim  
14 in which the beverage has a fat content of between  
15 7% and 12%.  
16
- 17 12 A method of producing a dispersion of bubbles in a  
18 milk containing beverage, the method comprising  
19 dissolving a gas in the beverage, sealing the  
20 beverage and dissolved gas in a broachable  
21 container, allowing pressure to be induced within  
22 the container and broaching the container to  
23 release the pressure therein, such that upon  
24 dispensing the beverage, at least some of the  
25 dissolved gas comes out of solution to form the  
26 dispersion of bubbles in the beverage.  
27
- 28 13 A beverage substantially as described herein with  
29 reference to any one of the given examples.  
30

# INTERNATIONAL SEARCH REPORT

International Application No.

PCT/GB 96/00898

## A. CLASSIFICATION OF SUBJECT MATTER

IPC 6 A23C9/152 A23C9/154 C12G3/04

According to International Patent Classification (IPC) or to both national classification and IPC

## B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

IPC 6 A23C

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practical, search terms used)

## C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category *	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	WO,A,90 03119 (DAIRY RESEARCH INC) 5 April 1990 see page 5, line 13 - line 20; claim 1 see page 16, line 1 - line 7 see page 22, line 32 - page 23, line 24 ---	1,2,5-13
X	FR,A,1 538 716 (SA CHAMBOURCY) 29 July 1968 see the whole document ---	1,3-7, 9-13
X	US,A,1 403 223 (C. ARNOLDI) 10 January 1922 see page 2, line 17 - line 63; claims 1-4 ---	1,2,5-7, 9-13
X	US,A,4 804 552 (S. AHMED ET AL.) 14 February 1989 see column 2, line 27 - line 58; examples 1,2 ---	1,2,5-7, 9-13
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☒ Further documents are listed in the continuation of box C.

☒ Patent family members are listed in annex.

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Date of the actual completion of the international search

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# INTERNATIONAL SEARCH REPORT

International Application No.

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## C.(Continuation) DOCUMENTS CONSIDERED TO BE RELEVANT

Category *	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	US,A,1 912 439 (M. FELLER) 6 June 1933  see page 2, line 25 - line 63; claim 1 see page 3, line 103 - page 4, line 39 ---	1,2,5-7, 9-13
X	US,A,2 394 303 (H. GRIESBECK) 5 February 1946  see column 1, line 37 - column 2, line 12; claim 1 ---	1,2,5-7, 9,10,12, 13
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